REMARKS

Reconsideration is requested.

Claims 32, 33 and 35-61 are pending. Claims 58 and 59 have been withdrawn from consideration.

.Claim 32 has been amended, without prejudice, to additionally define the claimed invention. The details of claim 43 have been added to claim 32, for example, without prejudice. Claim 43 has been canceled, without prejudice. Claims 32, 33, 35-42 and 44-61 will be pending upon entry of the present Amendment.

The claimed invention as described in claim 32 additionally requires that the electric currents of the first and second photoelectric conversion elements are substantially the same; the condition of following relationship is to be satisfied (Jc/Jd) > 0.7; and these conditions are achieved under the condition that the first photoelectric conversion elements and the second photoelectric conversion elements are different in at least one among the composition of the electrolytic layers, the thickness of the porous photoelectric conversion layers, the width of the porous photoelectric conversion layers, and the average particle diameter of the semiconductor particles composing the porous photoelectric conversion layers. The cited art fails to teach or suggest the claimed invention.

The Section 112, first paragraph "written description", rejection of claims 32, 33, 35-57, 60 and 61 is traversed. Reconsideration and withdrawal of the rejection are requested in view of, for example, the comments of record, the above amendments, as well as the following.

The details of claim 43 have been added to claim 32. The relationship of now-canceled claim 43 is described, for example, in lines 7-14 of page 46 of the specification.

The specification describes the following in the paragraph spanning pages 65-66:

> Basically, in the case solar cells with different properties are connected in series, the voltage of the entire module is the total of the voltage values of the unit cells, however with respect to the electric current value, in the unit cell showing a low electric current value, the electron flow is deteriorated and therefore it is impossible to extract the electric current of the unit cell showing a high electric current value. Accordingly, in the case dye having the same capability for unit cells is used, the short circuit current density is high in the case the light receiving face is set in the porous photoelectric conversion layer side and the short circuit current density is low in the case the light receiving face is set in the catalyst layer side and therefore the output of the module in which the respective unit cells are connected in series is deteriorated and the durability is decreased. Therefore, the conversion efficiency and the durability of the module are improved by using a dye for the unit cell in which the light receiving face is set in the catalyst layer side, the dye capable of generating electric current relatively higher in the unit cell in which the light receiving face is set in the catalyst layer side than in the unit cell in which the light receiving face is set in the porous photoelectric conversion layer.

One of ordinary skill in the art will appreciate from the above that an embodiment of the disclosed invention involves improving the conversion efficiency and the durability of a solar cell module according to the disclosure by increasing the electric current in a unit cell in which the light receiving face is set in the catalyst layer than in the unit cell in which the light receiving face is set in the porous photoelectric conversion side because

in this way a greater electric current value of the solar cells may be achieved given that the current of the solar cells is closer to the current value of the lower unit cell.

This approach is also described, for example, in the following paragraph spanning pages lines 8-21 of page 28 of the specification:

> On the other hand, in the present invention, in the case the iodine concentration is controlled to be 0.05 mole/l and 0.02 mole/l in the cell units in which the light receiving face is set in the porous photoelectric conversion layer side and in the catalyst layer side, respectively, the difference of the short circuit current value of the respective cell units is about 1 mA or lower and approximately the same output can be obtained. Accordingly, a higher output power can be obtained in the case of a dye-sensitized solar cell module which comprises a plurality of solar cell units each comprising a conductive layer, a porous photoelectric conversion layer adsorbing a dye, an electrolytic layer, a catalyst layer, and a conductively layer successively layered between substrates and which is produced by alternately and reversely arranging the porous photoelectric conversion layers and the catalyst layers and electrically connecting the solar cell units in series.

The specification similarly teaches the following in the paragraphs spanning line 19 of page 41 through line 13 of page 42:

> In the case the catalyst layer exists in the light receiving face side, the quantity of light reaching the photoelectric conversion layer is decreased because of the absorption by iodine and the electrolytic substances in the electrolytic solution as described above. Also, if a plurality of dye-sensitized solar cells are connected in series, the obtained short circuit current is controlled on the basis of the lowest short circuit current of the dye-sensitized solar cells. Accordingly, if the method of direct connection of the present invention is employed and in the case dye-sensitized solar cells with the same constitutions are employed, since the short circuit current of a solar cell in which the porous photoelectric conversion layer exists in the light receiving face side is higher than the short circuit current of a solar cell

> in which the catalyst layer exists in the light receiving face side, the short circuit current density of the solar cell in which the porous photoelectric conversion layer exists cannot entirely be extracted and the module conversion efficiency is considerably decreased more than the photoelectric conversion efficiency of a single dye-sensitized solar cell.
>
> On the other hand, in a dye-sensitized solar cell, if the thickness of the photoelectric conversion layer is changed, the voltage and the current density is changed and if the thickness is made thick, the voltage tends to be low and the current density tends to increase. For example, in the case the thicknesses of photoelectric conversion layers are made the same, the short circuit current can efficiently be extracted and the open circuit voltage can be increased by making the thickness of single dye-sensitized solar cells in which the short circuit current density is increased thin and accordingly it is expected that the module conversion efficiency is increased.

One of ordinary skill in the art will appreciate that the applicants were in possession of the claimed invention at the time the application was filed.

The Examiner will appreciate that an objective standard is used in determining the sufficiency of the written description. That is, the courts have stated the issue as one of whether the description clearly allow persons of ordinary skill in the art to recognize that he or she invented what is claimed. See In re Gosteli, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). To comply with the written description requirement, an applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed. See Vas-Cath, Inc. v. Mahurkar, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). An applicant may show possession of the claimed

invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention. Lockwood v. American Airlines, Inc., 41 USPQ2d 1961, 1966 (Fed. Cir. 1997). Possession may be shown in a variety of ways including description of an actual reduction to practice, or by structural chemical formulas that show that the invention was complete, or by describing distinguishing identifying characteristics sufficient to show that the applicant was in possession of the claimed invention. See, *e.g.*, Pfaff v. Wells Elecs., Inc., 48 USPQ2d 1641, 1647 (1998).

The subject matter of the claim need not be described literally (i.e., using the same terms or *in haec verba*) in order for the disclosure to satisfy the description requirement.

One of ordinary skill in the art will appreciate that the applicants were in possession of the claimed invention at the time the application was filed. Withdrawal of the Section 112, first paragraph, rejection is requested.

The following art has been relied on by the Examiner in the Office Action of December 22, 2011 and the art will be referred to herein by the following document ("D") numbers for convenience:

D1 - Gaudiana (U.S. Patent Application Publication No. 20030140959);

D2 – Wanlass (U.S. Patent No. 5,322,572);

D3 – Boschloo ("Optimization of dye-sensitized solar cells prepared by compression method" Sept 2001, Journal of Photochemistry and Photobiology A: Chemistry 148 pp 11-15);

D4 - Gay (U.S. Patent No. 4,461,922);

D5 - Gaudiana (U.S. Patent Application Publication No. 20030230337);

D6 - Chiba (U.S. Patent Application Publication No. 20020134426);

D7 - Linquist (WO9963599);

D8 - Nazeeruddin ("Investigation of Sensitizer Adsorption and the Influence of Protons on Current and Voltage of a Dye-Sensitized Nanocrystalline TiO_2 Solar Cell" J. Phys. Chem. B 2003,107, 8981-8987); and

D9 - Gratzel ("Perspectives for Dye-sensitized Nanocrystalline Solar Cells" Prog. Photovolt. Res. Appl. 8, 171-185 (2000)).

The following rejections are traversed:

the Section 103 rejection of claims 32-33, 40-47, 49, 50 and 60 over D1 and D2;

the Section 103 rejection of claims 35 and 36 over D1, D2, D3 and D4;

the Section 103 rejection of claims 37 and 38 over D1, D2 and D5;

the Section 103 rejection of claim 39 over D1, D2, D5 and D6,

the Section 103 rejection of claims 48 and 51-54 over D1, D2 and D6;

the Section 103 rejection of claims 55-57 over D1, D2 and D7; and

the Section 103 rejection of claim 61 over D1, D2, D6, D8 and D9.

Reconsideration and withdrawal of the Section 103 rejections are requested in view of the following and the above.

D1 describes a photovoltaic cell wherein preferably the conductive **152** and insulative **180** regions of the electrical connection layers **105**, **107** include transparent materials. See ¶[0021] of D1. Moreover, D1 teaches that the photovoltaic module **10** of

the reference is "significantly light transmitting" wherein all of the constituent layers and regions of the photovoltaic module **10** is formed to be significantly light transmitting. . See ¶[0022] of D1. D1 therefore describes modules wherein preferably the first substrate and second substrate identified by the Examiner (i.e., **100** and **102** in Figure 5I of D1 (see pages 3-4 of the Office Action dated December 22, 2011)) are transparent or are each light receiving sides.

As substantially all of the materials of D1 are transparent, and light receiving, one of ordinary skill would not have been motivated by D1 to have made the photoelectric conversion elements different in order to provide the same amount of electric currents, as required by the presently claimed invention. Specifically, as described in the present specification, such as in the paragraphs spanning pages 41-42 of the specification, the differences in the elements can be used to correct for reduced conversion efficiencies resulting from a non-light receiving side of the claimed invention.

As admitted by the Examiner on page 5 of the Office Action dated December 22, 2011, D1 fails to teach the differences in the elements of the claimed invention. D1 also fails to suggest such a difference as, for example, all the components of D1 are preferably made of materials which transmit light and the two substrates of the modules of D1 are light receiving sides of the module.

In *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415 (2007), the Supreme Court emphasized "an expansive and flexible approach" to the obviousness question. Nonetheless, the Court reaffirmed that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently,

known in the prior art." *Id.*, at 418. The Court stated "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does … because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. *Id.*, at 418-419.

There is no suggestion in D1 to have made the elements of the presently claimed invention.

The secondary reference, D2, fails to cure the deficiencies of D1. D2 does not relate to dye-sensitized cell modules of the presently claimed invention or of D1. D2 relates to monolithic multijunction tandem photovoltaic solar cells comprising layers of InP and GaInAsP and containing a prismatic cover layer. The GaInAs subcell of D2 is lattice matched with the InP layer and the InP subcell has a larger energy band gap than the first subcell of D2 One of ordinary skill would not have been motivated by D2 to alter or supplement the teachings of D1 to make the presently claimed invention.

The passing reference in D2 to "adjusting the areas of the upper and lower subcells to match the current densities of the two subcells" (see column 8, lines 50-51 of D2) and "In the series connected type of tandem solar cells, there is current matching of the two subcells." (see column 2, lines 54-56 of D2), would not have suggested to one of ordinary skill in the art to have made the claimed invention from D1.

The appreciation that the size of elements, in unrelated components, could be altered would not have led to alteration of the elements of D1 as an "optimization" in the

manner suggested by the Examiner. See page 6 of the Office Action dated December 22, 2011.

D2 also states that "In another specific embodiment of the solar cell illustrated in FIG. 2, the solar cell can be optimized by adjusting the areas of the upper and lower subcells to match the current densities of the two subcells." See column 8, lines 48-51. The applicants understand the Examiner to believe that the claimed invention would have allegedly been obvious by incorporating the technique of D2 disclosing "current matching of the two series connected subcells" into D1. However, the two series connected subcells of D2 are the top (upper) subcell 30 and the bottom (lower) subcell 40 in the tandem photovoltaic solar cell of FIG. 2 wherein these subcells are aligned in the direction of the thickness of the tandem photovoltaic solar cell (the light incident direction).

In the claimed invention however, the two neighboring cells (first photoelectric conversion element and second photoelectric conversion element) both electrically connected in series are arranged orthogonal to the thickness of the dye-sensitized solar cell module (orthogonal to the light incident direction).

The claimed invention would not have been obvious in view of the cited art.

The dependent claims rejected over the combination of D1 and D2 are patentable over the cited combination of art for similar reasons.

Withdrawal of the Section 103 rejection of the claims over the combination of D1 and D2 is requested.

The Section 103 rejection of claims 35 and 36 over the combination of D1, D2, D3 and D4 is traversed. The additional teaching of D3 and D4 fail to cure the deficiencies of the combination of D1 and D2 noted above. Further, the unexpected benefit of the presently claimed invention (i.e., the production of an effective power as a result of the same current from the first and second photoelectric conversion elements of the claimed invention) would not have been obvious from the cited combination of art. Withdrawal of the Section 103 rejection is requested.

The Section 103 rejection of claims 37 and 38 over the combination of D1, D2, and D5 is traversed. The additional teachings of D5 fail to cure the deficiencies of the combination of D1 and D2 noted above. Withdrawal of the Section 103 rejection is requested.

The Section 103 rejection of claim 39 over the combination of D1, D2, D5 and D6 is traversed. The additional teaching of D5 and D6 fail to cure the deficiencies of the combination of D1 and D2 noted above. Further, the unexpected benefit of the presently claimed invention (i.e., the production of an effective power as a result of the same current from the first and second photoelectric conversion elements of the claimed invention) would not have been obvious from the cited combination of art. Withdrawal of the Section 103 rejection is requested.

The Section 103 rejection of claim 48 and 51-54 over the combination of D1, D2 and D6 is traversed. The additional teaching of D6 fail to cure the deficiencies of the combination of D1 and D2 noted above. Further, the unexpected benefit of the presently claimed invention (i.e., the production of an effective power as a result of the

same current from the first and second photoelectric conversion elements of the claimed invention) would not have been obvious from the cited combination of art. Withdrawal of the Section 103 rejection is requested.

The Section 103 rejection of claims 55-57 over the combination of D1, D2 and D7 is traversed. The additional teaching of D7 fail to cure the deficiencies of the combination of D1 and D2 noted above. Further, the unexpected benefit of the presently claimed invention (i.e., the production of an effective power as a result of the same current from the first and second photoelectric conversion elements of the claimed invention) would not have been obvious from the cited combination of art. Withdrawal of the Section 103 rejection is requested.

The Section 103 rejection of claim 61 over the combination of D1, D2, D6, D8 and D9 is traversed. The additional teachings of D6, D8 and D9 fail to cure the deficiencies of the combination of D1 and D2 noted above. Further, the unexpected benefit of the presently claimed invention (i.e., the production of an effective power as a result of the same current from the first and second photoelectric conversion elements of the claimed invention) would not have been obvious from the cited combination of art. Withdrawal of the Section 103 rejection is requested.

The claims are submitted to be in condition for allowance and a Notice to that effect is requested. The Examiner is requested to contact the undersigned, preferably by telephone, in the event anything further is required.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /B. J. Sadoff/
B. J. Sadoff
Reg. No. 36,663

BJS:pp
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100